

# DISC INSERTION PREVENTIVE DEVICE

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention relates to a disc insertion preventive device which assures that when a disc apparatus is already loaded with a disc, another disc is prevented from being inserted into the apparatus

### 2. Related Art

The disc apparatus records or reproduces information such as sound and pictures that stored in a disc, which is put on its turning table. There are various loading methods. For one example use is made of a reciprocating tray which carries a disc from the disc slot to the turning table or vice versa. For another example use is made of a pull-in mechanism which is responsive to insertion of a disc from the disc slot for gripping and pulling the disc toward the turning table in the housing.

A disc insertion preventive device according to the present invention is appropriate for use in the latter loading type. The user often tries to push a disc into the disc apparatus without making sure that it is not loaded with a disc. Then, the new disc hits the loaded disc so that they may be harmed or spoiled together. With a view to prevent such an incident some disc apparatuses are equipped with insertion preventive means.

JP2001-331999(A), titled "Disc Device" shows a disc apparatus equipped with disc insertion preventive means, wherein it is allowed the sure closing of an inserting and discharging member by an accidental insertion preventive member by making a movable range of the accidental insertion preventive member larger with respect to a descending distance of a movable base. This proposed structure is complicated and accordingly the manufacturing cost is high.

JP2002-150652(A), titled "Slot-In Type Optical Disc Reproducing Device" uses various sensors to detect and reject any undesired disc even if it is inadvertently inserted in the disc apparatus. The insertion preventive mechanism cannot work even if a single sensor does not function well, and the optical detecting-and-rejecting unit is less reliable than the mechanical one.

In view of the above one object of the present invention is to provide a disc insertion preventive device which is simple in structure, still assuring that when a disc

apparatus is already loaded with a disc, another disc is prevented from being inserted into the device, no matter what size or shape the subsequent disc may have.

## **SUMMARY OF THE INVENTION**

5           To attain this object a disc insertion preventive device according to the present invention comprises: a housing having a disc slot made on its front side; a stopper having a flat plate and front and rear blocking pieces dependent from the opposite lateral edges of the flat plate, the stopper being pivotally fixed to the housing with the front blocking piece directed toward the disc slot of the housing; and swinging  
10 means responsive to the absence of a disc in the housing for inclining the stopper with the rear blocking piece down and with the front blocking piece up, thus preventing advance of a disc beyond the descendent rear blocking piece; responsive to insertion of a disc for keeping the stopper horizontal, thereby permitting advance of the disc to the final loading position in the housing, and responsive to the presence of  
15 a disc in the housing for inclining the stopper with the rear blocking piece up and with the front blocking piece down, thereby preventing insertion of another disc from the disc slot.

          The flat plate of the stopper may have first and second lateral narrow extensions from its opposite sides, and a leg extension extending downward from  
20 lateral side end of the first lateral narrow extension, the first lateral narrow extension having a slope formed on its upper surface. While, the swinging means may comprises: a first rotary lever having first and second arms, the first rotary lever being placed next to one end of the disc slot, and being spring-biased toward the stand-by position in which: the first arm is located to be hit and pushed by a disc when inserted  
25 in the disc slot; and the second arm is applied to the slope of the first lateral narrow extension of the flat plate of the stopper whereby the stopper may balance on the leg extension in response to insertion of the disc from the disc slot, allowing advance of the disc to the final loading position; a second rotary lever one end being rotatably fixed to the housing; forward and rearward rolls both ganged and movably fixed to  
30 the housing, and operatively connected to the second rotary lever, the rearward roll having latch means to keep the stopper inclined with the rear blocking piece down and with the front blocking piece up; the forward roll being placed so close to the other end of the disc slot as to be hit and pushed by a disc when inserted in the disc slot, whereby the ganged rolls are shifted laterally to allow the rearward roll to release

the stopper, and at the same time rotate the second rotary lever until it catch the other engagement projection of the second lateral narrow extension of the flat plate of the stopper, thus keeping the stopper standing on the leg extension; and a slider movably fixed to the housing, the slider having a cam abutting the leg extension of the stopper, the slider being movable in unison of the advance of the disc in the housing while allowing the leg extension to follow the cam contour, thus tilting the stopper when the disc reaches the final loading position so that the rear blocking piece rises up and that the front blocking piece descends down, thus preventing insertion of another disc from the disc slot.

The first rotary lever further may have a third arm to abut and hold the flat plate of the stopper when the second arm makes the stopper balance on the leg extension, thus preventing further rotation of the second arm.

Other objects and advantages of the present invention will be understood from the following description of a disc insertion preventive device according to one preferred embodiment of the present invention, which is shown in accompanying drawings.

## **BRIEF DESCRIPTION OF THE DRAWING**

Figs.1(A), 1(B) and 1(C) show how the stopper change its postures while a disc is inserted from the disc slot until it reaches the final loading position in the housing;

Fig.2 is a plan view of the disc insertion preventive device, showing how its parts are operatively connected together before the disc is inserted in the housing;

Fig.3 is a perspective view of the first lever and the first lateral narrow extension of the stopper, showing how they are operatively connected before the disc is inserted in the housing;

Fig.4 is a similar perspective view, but showing how the first lever works on the first lateral narrow extension of the stopper when the disc is inserted to hit and rotate the first lever;

Fig.5 is a plan view of the disc insertion preventive device, showing how its parts are operatively connected together when the disc is partly inserted into the housing;

Fig.6 is a plan view of the ganged rolls, which is responsive to insertion of the disc for moving and giving the way to the advancing disc (broken lines);

Fig.7 is a plan view of the disc insertion preventive device, showing how its parts are operatively connected together when approximately two thirds of the disc is pushed in the housing; and

Fig.8 is a plan view of the disc insertion preventive device, showing how its parts are operatively connected together when the disc is loaded.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Referring to Figs.1 and 2, a disc insertion preventive device comprises a housing 1 having a disc slot 1a made on its front side; a stopper 2 and means for swinging the stopper 2 (later described). The stopper 2 comprises a linear-and-convex flat plate having two lateral narrow extensions 16 and 17, and front and rear blocking pieces 4 and 5 dependent from the linear and convex edges of the flat plate. The first lateral narrow extension 16 has a slope 16a rising higher toward the disc slot 1a whereas the second lateral narrow extension 17 has engagement projections 18 and 24 directed rearward. The stopper 2 is fixed to the housing 1 to rotate about its pivots 3, 3 via short legs 27, 27 extended from the both lateral side ends of the first and second narrow extensions 16 and 17, the front blocking piece 4 being directed toward the disc slot 1a of the housing 1. The short leg 27 of the first lateral narrow extension 16 has a leg extension 27a extending downward (see Figs.1(A) to 1(C)). The way 7 running from the disc slot 1a to the final loading position is defined between the intermediate flat surface 6 and the swingable stopper 2.

The swinging means is responsive to the absence of a disc in the housing 1 for inclining the stopper 2 with the rear blocking piece 5 down and with the front blocking piece 4 up, thus permitting insertion of a disc 8 from the disc slot 1a, but preventing advance of the disc 8 beyond the descendent rear blocking piece 5 by blocking the way 7 to the final loading position (see Fig.1(A)). The swinging means is responsive to the partial insertion of the disc 8 in the housing 1 for making the stopper 2 balance on its leg extension 27a, not blocking the way 7 running from the disc slot 1a to the final loading position (see Fig.1(B)). Also, the swinging means is responsive to the presence of a disc in the housing 1 for inclining the stopper 2 with the rear blocking piece 5 up and with the front blocking piece 4 down, thus preventing insertion of another disc 8 from the disc slot (see Fig.1(C)).

Referring to Figs. 2 to 7, the swinging means comprises a first rotary lever 12, a second rotary lever 21, forward and rearward rolls 10a and 10b, and a slider 25

(see Fig.1). The first rotary lever 12 has first, second and third arms 29, 15 and 28. It is placed next to one end of the disc slot 1a (the left end of the disc slot in Fig.2), and is spring-biased toward the stand-by position (see Fig.1(A)) in which: the first arm 29 is located to be hit and pushed by a disc 8 when inserted in the disc slot 1a; and  
5 the second arm 15 is applied to the slope 16a of the first lateral narrow extension 16 of the flat plate of the stopper 2 (see Figs.2 and 3). The second arm 15 is pushed to a hook 16b projected from the rear side edge of the first lateral narrow extension 16 in the stand-by position. When the disc 8 is inserted from the disc slot 1a, it hits and pushes the first arm 29. Then, the first arm 29 is yieldingly rotated clockwise,  
10 making the second arm 15 push the slope 16a (see Figs.4 and 5) until the second arm 15 makes the stopper 2 balance on the leg extension 27a. The third arm 28 abuts and holds the first lateral narrow extension 16 of the flat plate of the stopper 2, thus preventing further rotation of the second arm 15 (see Fig.4). In this position two thirds of the disc 8 is inserted into the housing 1. The stopper 2 unblocks the way 7  
15 to the final loading position (see Fig.1(B)). Thus, advance of the disc 8 to the final loading position is permitted.

The forward and rearward rolls 10a and 10b are ganged and movably fixed to the housing 1 (see Fig.6). The ganged rolls 10a and 10b confront the first rotary lever 12. The second rotary lever 21 looks like a fishhook. It has a pivot 22 on one  
20 end and a curved recess formed on the other end. Also, it has a small flat projection 23 formed next to the curved recess. The second rotary lever 21 is rotatably fixed to the housing 1, and is operatively connected to the rearward roll 10b of the ganged rolls 10a and 10b. The rearward roll 10b has a rearward finger 20 and latch means 19 formed on its top. In the stand-by position (Fig.1(A)) the rearward finger 20 extends close to the curved recess of the second rotary lever 21 (see Fig.2). The  
25 latch means 19 catches the engagement projection 18 of the second lateral extension of the stopper 2, thus keeping the stopper 2 inclined with the rear blocking piece 5 down and with the front blocking piece 4 up.

The forward roll 10a is placed so close to the other end of the disc slot 1a (the  
30 right end of the disc slot in Fig.2) as to be hit and pushed by a disc 8 when it is inserted in the disc slot 1a, thus making the ganged rolls 10a and 10b move sideways to allow the rearward roll 10b to release engagement projection 18 of the second lateral extension of the stopper 2. At the same time, the second rotary lever 21 is made to turn until the small flat projection 23 crawls under the engagement projection

24 of the second lateral extension of the stopper 2, thus keeping the stopper 2 balancing on the leg extension 27a (see Figs.1(B) and 7).

When insertion of the disc 8 is detected by a sensor (not shown), first and second drive rolls 9a and 9b start rotating to pull the disc 8 into the housing 1. Then, the disc 8 is pinched between the first and second drive rolls 9a and 9b and the ganged rolls 10a and 10b, and the disc 8 is carried to the final loading position where the turntable is ready to fit the disc 8.

The slider 25 is movably fixed to the housing 1 (see Fig1). The slider 25 has a cam 26 abutting the leg extension 27a of the stopper 2, and it is movable in unison with the advance of the disc 8 in the housing 1 while allowing the leg extension 27a to follow the cam contour 26. Thus, the stopper 2 is tilted so that the rear blocking piece 5 rises up and that the front blocking piece 4 descends down (see Fig.1(C)). Thus, insertion of another disc from the disc slot 1a is prevented when the disc 8 reaches the final loading position. Fig.8 shows that the disc 8 is fully inserted in the disc apparatus.

Release of the disc 8 from the turntable make: the leg extension 27a of the stopper 2 return toward the disc slot 1a; the first and second rolls 10a and 10b move inward; the first lever 12 rotate counter clockwise; and the stopper 2 return from Fig.1(B) to Fig.1(A). All these parts are spring-biased to return to their initial positions in response to release and ejection of the disc from the disc apparatus.

As described above, when the disc apparatus is loaded with a disc 8, the rear blocking piece 5 of the stopper 2 blocks the way 7 to the loading position (see Fig.1(C)), thereby preventing another disc if inserted from the disc slot 1a from reaching the turntable. When the disc apparatus is not loaded, the stopper 2 remains in the stand-by position (Fig.1(A)), where the loading of a smaller disc (80 mm in diameter) is not permitted. Specifically when the smaller disc is inserted from the disc slot 1a, it cannot move forward beyond the descending rear blocking piece 5. It is too small in diameter to hit and actuate the first rotary lever 12 and the forward roll 10a simultaneously. Specifically, the clockwise rotation of the first rotary lever 12 and the outward movement of the ganged rolls 10a and 10b cannot be caused simultaneously, and therefore, the stopper 2 remains in the stand-by position, in which the rear blocking piece 5 blocks the way 7 to the loading position. Likewise, insertion of a deformed disc is not permitted.

Any swinging means other than the above described one can be used as for

instance follows: the stopper is connected to and driven by an electric motor. The electric motor turns the stopper when associated sensors detect insertion of a disc from the disc slot. Such sensors may be arranged to detect discs in respect of their sizes. They direct signals to the electric motor only when they recognize the disc of regular size and shape. Some sensors may be arranged in the vicinity of the turntable, and the stopper remains in Fig.1(C) as long as the sensors detect the loading of the disc.